



# A conceptual model for CEA in Fishery Management Plans

**Chad Demarest**

**NOAA Fisheries NERO/NEFMC**

**NOAA Social Sciences Workshop**

**October 27, 2004**

# Outline

- ▶ Objective
- ▶ Conceptual model
- ▶ Questions



# Objective

To explicitly address the relationships between various analytic elements required for a fully-specified cumulative effects assessment.

# Conceptual model: the basics

It all begins with the VECs...

- “CEs need to be analyzed in terms of *the specific resource, ecosystem and human community* being affected”

...and the Alternatives

- “By definition, CEs must be evaluated along with the direct and indirect effects *of each alternative*”

-CEQ 1997 (emphasis added)

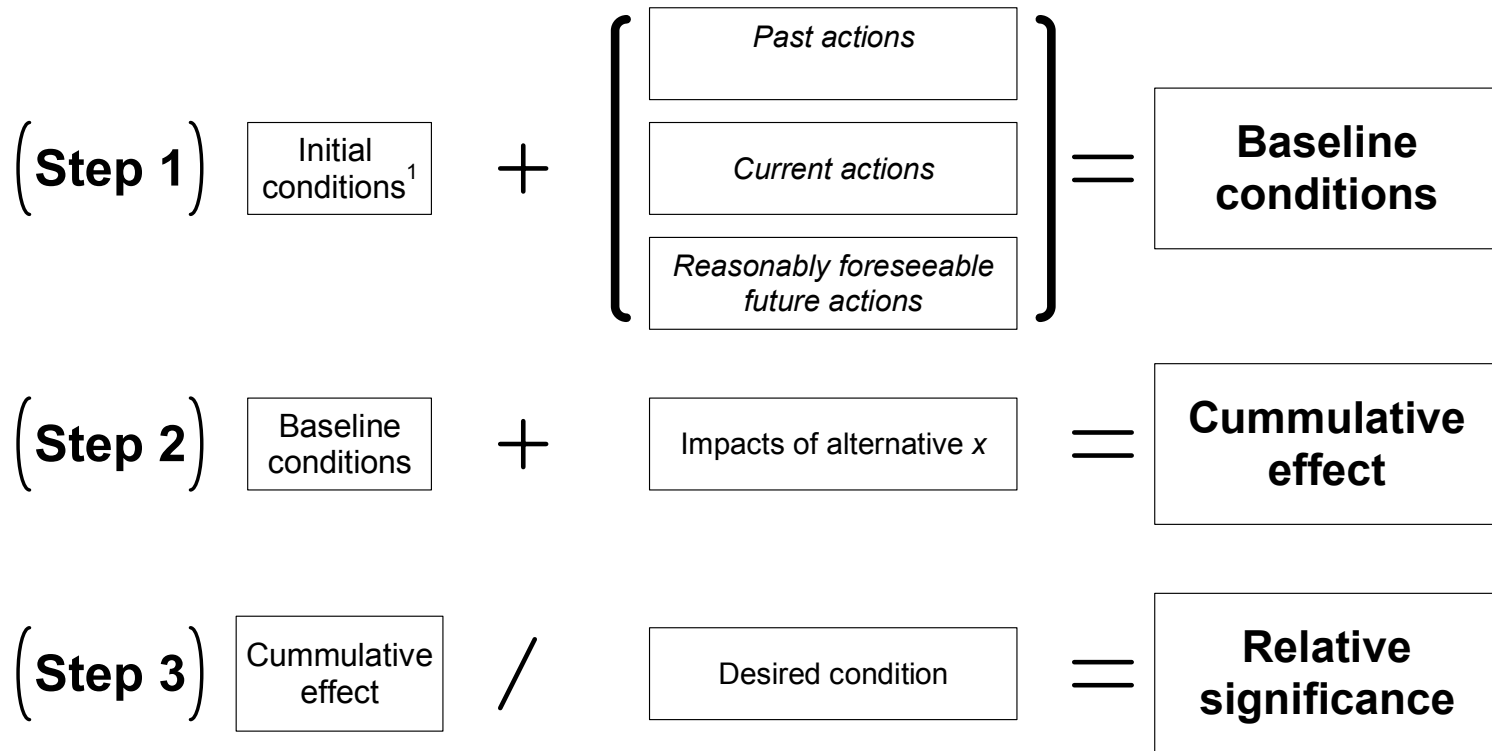
# Conceptual model: the components

## Required elements:

- Indicators
- Initial, Baseline and Desired conditions
- Time and place
- Past, present and reasonably foreseeable future actions
- Significance, thresholds and acceptable degradations

# Conceptual model: the basic three-step approach

The following three steps apply for each VEC



<sup>1</sup> Initial Conditions = explicitly defined analytic starting point

# Conceptual model:

## Step 1

$$(1) \beta_{i,t,r} = I_{i,t,r} + \sum f(P^n, F^n)_{i,t,r} f(P^e, C^e, F^e)_{i,t,r}$$

$$i=1,2,3\dots,n; j=1,2,3\dots,m; r=1,2,3\dots,y; t=0,1,2,3,\dots x\dots,z$$

Where:

- $\beta$  = Baseline conditions for indicator  $i$  and region  $r$  at time  $x \leq t \leq z$
- $I$  = Initial conditions at time  $t=0$
- $P$  = Impacts of endogenous ( $^n$ ) and exogenous ( $^e$ ) past actions at time  $0 < t < x$
- $C$  = Impacts of exogenous current actions at time  $t=x$
- $F$  = Impacts of endogenous and exogenous reasonably foreseeable future actions at time  $x < t < z$

# Conceptual model: Step 2

$$(2) CC_{\mu, i, r} = f(\beta_{i, r}, \Phi_{\mu}) \text{ and}$$

$$(3) CE_{\mu, i, r} = CC_{\mu, i, r} - \beta_{i, r}$$

Where:

- $CC$  = Post-action cumulative condition
- $\Phi$  = Impacts of alternative  $\mu$
- $CE$  = Cumulative effect



# Conceptual model: Step 3

$$(3) \Omega = CC_{\mu, i, t, r} / k_{i, r} \text{ and,}$$

$$(4) k_{i, r} = \theta_{i, r} - \alpha$$

Where:

- $\Omega$  = Relative significance
- $k$  = Significance threshold
- $\theta$  = Desired condition
- $\alpha$  = Acceptable level of degradation

# Questions

- ▶ Given that actions are defined as being of human origin, and that only actions are required elements in a cumulative effects analysis, is there a need to incorporate a non-anthropogenic environmental change variable into cumulative effects assessments?
- ▶ Should concepts such as thresholds and desired conditions be defined on a region-specific basis, or should they be general enough to apply across all regions?
- ▶ For social science VECs, is it possible to define desired conditions and thresholds?
- ▶ Should the agency take the lead on defining these concepts?
- ▶ If so, what is the best way to begin?